UNIT 2 AGRICULTURE AND ALLIED SECTOR

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2.1 INTRODUCTION

We are well aware of the fact that agriculture is one among the oldest and most fundamental primary occupations of all human beings since Stone Age. It is considered as the foundation of all social cultural and economical condition of mankind. The oldest civilization of the world depends upon Agriculture. Agriculture can be defined as the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel and other products used to sustain life. The Webster’s New International Dictionary describes agriculture as “the art or science of cultivating the ground, including rearing and management of livestock, husbandry, farming, etc. and also including in its broad sense farming, horticulture, forestry, butter and cheese making etc.”

Agriculture affects health, and health affects agriculture. Agriculture supports health by providing food and nutrition for the world’s people and by generating income that can be spent on health care. We have witnessed great changes in agriculture particularly in the last 40 years. Now days in many parts of the world, agriculture is becoming increasingly mechanized with wide use of fertilizers, pesticides and other harmful chemicals. This change in agricultural work practices, is improving agricultural production but also bring with it a
risk of adverse health effects. The result is that the agriculture is consistently ranks among the most hazardous occupational industries and agriculture workers are at risk of injuries, illnesses, disability, and death. Agricultural production and food consumption can also increase the risks of water-related diseases (malaria) and food-borne diseases as well as health hazards linked with specific agricultural systems and practices, such as infectious animal diseases, pesticide poisoning, and aflatoxicosis.

Agricultural work is considered one of the dangerous occupations in the world. Data from the International Labour Organization (ILO) and the Food and Agriculture Organization (FAO) showed that many fatal work-related accidents every year occur in agriculture. Physical hazards, for instance, include exposure to weather, terrain, fires and machinery. In addition, agricultural workers are also prone to toxicological hazards brought about by pesticides, fertilizers and fuels, as well as health insults of dusts. Other hazards cited by the UN agencies are those inherent in animal handling and contact with dangerous plants and biological agents, that give rise to allergies, respiratory disorders, zoonotic infections and parasitic diseases.

Dear learners, in this unit we will discuss the occupational health hazards from agriculture and allied sectors.

### 2.2 OBJECTIVES

After completing this unit, you will be able to:

- identify various agriculture activities causing health hazards;
- describe the major occupational health hazards in agriculture and allied sector;
- explain the agriculture respiratory health hazards; and
- list the occupational hazard in green house.

### 2.3 AGRICULTURE AND ALLIED SECTOR

Human beings began to alter the earth’s environment for his greed since thousands of years ago. First, it was through the use of simple tools for hunting and gathering, and later with more complex tools for land cultivation (for planting purposes) and rearing of animals.

Agricultural Sector is divided into four main sub-sectors, namely:

1. Crops;
2. Livestock (both production and animal health);
3. Fisheries and Aquaculture (including capture fisheries); and
4. Forestry.

Agriculture, livestock, forestry and fishing include three broad industry groups:

- Agriculture includes two basic activities, namely the production of crop products and production of animal products;
- Forestry and logging includes the production of round wood as well as the extraction and gathering of wild growing non wood products (e.g., mushrooms, berries and nuts); and
- Fishing and aquaculture.
2.3.1 Agricultural Activities

In many countries, agriculture is ranked as one of the most hazardous sectors. Main industries are included in this sector, such as horticulture, grain farming, cattle farming, animal husbandry, fishing, and forestry. Agricultural workers often work long hours and are exposed to numerous safety, health, and environmental hazards. The most common hazards in the agricultural industry include manual harvesting, farm machinery, exposure to pesticides and other chemicals used in this industry, etc.

Agricultural work embraces a wide range of activities including animal husbandry, planting and cultivation, harvesting and storage, transport, maintenance and repair, and construction. Animal diseases are also an important environmental problem associated with livestock in agriculture. Harvesting, processing, and storage of crops may also be hazardous. The machines used for these purposes are designed to shake, strip, and shred. This equipment is becoming more and more sophisticated, with a goal of increasing worker efficiency and production. The level of training required to operate the more sophisticated devices increases proportionately with their development because of the risk of exposure to fumigants and dust and the risk of (grain) drowning. Transport of goods and services in agricultural work is a major activity: moving, equipment to and from the fields, collecting crops and moving them to market or storage areas. Operators of farm transport equipment may include not only the farmer but also family members.

Maintenance and repair are functions that necessarily accompany the use of mechanical equipment. Maintenance and repair demand significant effort in farm work. These activities are usually accomplished in off-season periods. Depending upon the type of equipment being used, work hazards include burns, electric shock, entanglements, and falls. Construction includes building roads, digging holes and drainage, and irrigation ditches, clearing timber, and erecting buildings. These activities can be hazardous for the untrained worker. Mechanization, automation, the use of chemical products and biological preparations has brought about essential changes for agricultural workers. This is especially obvious in industrialized countries, whereas in most developing countries agriculture has retained its traditional character. However, even in industrialized countries, some agricultural activities remain unchanged. Agricultural workers today face, simultaneously, traditional and new biological, physical, and chemical hazards.

2.3.2 Agricultural Workforce

In many parts of the world, women constitute a large proportion of farmers. Children are often engaged in farm work where adult labour is insufficient for the workload. Because of their limited strength, knowledge, and experience and the absence of statutory provisions regarding their employment, they present a particularly important health problem. As countries move towards the production of more crops, increased mechanization, and increased use of pesticides, the agricultural worker is required to acquire new knowledge and skill so that modern technology may be used efficiently and safely.

Agricultural exposures that commonly lead to occupational injuries or illness are well documented. Large machinery, including tractors, power take-off devices, and livestock are among the most common mechanisms of injuries in agriculture. Exposures to dust, toxic gases, and physical hazards including
heat, cold, and noise, are among the most common causes of occupational related illnesses among agricultural workers. Common occupational related illnesses include respiratory illnesses, noise-induced hearing loss, and musculoskeletal disorders.

Exposure to agricultural hazards begins at a young age. Children as young as eight years old have reported driving tractors. High school aged agricultural workers have reported working with tractors, machinery, chemicals, and livestock.

Young adults have reported working with large livestock, driving tractors, combines, and all-terrain vehicles, mixing and applying chemicals, and working in livestock confinement buildings.

This population has already begun reporting agricultural-related injuries including cuts, burns, and falls. Additionally, these workers have reported early symptoms of agricultural-related illnesses including shortness of breath after working in a grain bin and ringing in the ears after working with loud agricultural equipment. Young adults are engaging in agricultural work and interacting with machines and equipment that are known to cause fatal and nonfatal injuries and illnesses. They also report injuries and symptoms of illnesses; however, it is unknown how young adults are engaging with equipment/machinery and if recommended guidelines for operation is being followed.

2.4 OCCUPATIONAL HAZARDS ASSOCIATED WITH AGRICULTURE AND ALLIED SECTORS

Occupational Hazards Associated with Agriculture and allied sectors are described in the table 2.1. Working conditions, workload and the occupational health and safety problems in agriculture depend broadly on agricultural technology. The introduction of new technology brings with it the risk of new health and safety problems. Increasing use of tractors, chainsaws and other types of agricultural machinery may increase the risk from accidents. The use or misuse of agricultural chemicals may result in poisoning. Exposure of workers to airborne dust in confined areas where animals are raised has been associated with respiratory disease, especially in the poultry processing industry. There is also epidemiological evidence of a higher incidence of respiratory symptoms (e.g. chest tightness, cough) and impairment of respiratory function in animal breeders in confined conditions.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Exposures</th>
<th>Potential Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiological (work design)</td>
<td>Heavy lifting, prolonged standing, awkward postures, repetitive motion, overexertion, lack of visibility</td>
<td>Low back pain, neck and shoulder pain, bursitis, tendonitis, carpal pain, bursitis, tendonitis, carpal pain</td>
</tr>
<tr>
<td>Physical</td>
<td>Slips and trips, falls from height, transport and trucking, machinery, electricity, fire, heat and cold, diving, noise,</td>
<td>Injuries, cuts, burns, broken bones, amputation, hypothermia, hyperthermia, drowning, electrocution, injury-related</td>
</tr>
</tbody>
</table>
## Agriculture and Allied Sector

<table>
<thead>
<tr>
<th>Category</th>
<th>Hazards</th>
<th>Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>Vibration, confined spaces, entanglement, underwater entrapment, solar radiation</td>
<td>Death, asphyxiation, decompression illness, sprains and strains</td>
</tr>
<tr>
<td></td>
<td>Disinfectants, parasiticides, pesticides, fungicides, antifoulants, anesthetics, antibiotics, radon gas from water sources, hydrogen sulfide, carbon monoxide, sulfites, dusts, fumes, styrene, needlesticks, flammabilities, battery explosion</td>
<td>Respiratory illness, burns, cancer, central nervous system effects, birth defects, reproductive effects, poisoning, hematopoietic effects, and lung, eye, or skin irritations</td>
</tr>
<tr>
<td>Biological</td>
<td>Sharp teeth, spines, aerosolized proteins, bacteria, parasites, skin contact with shellfish and finfish tissues and fluids, enzymes, airborne proteins and endotoxins, fish feed dust</td>
<td>Bites, cuts, punctures and related infections; allergy, asthma, eczema, urticaria (hives), chapped skin, itching.</td>
</tr>
<tr>
<td>Psychological</td>
<td>High demand and low control Situations, remote locations away from family, potential for large fish kills, abusive social environment</td>
<td>Work-related stress Most frequent hazards in agriculture are related to:</td>
</tr>
</tbody>
</table>

### Most frequent hazards in agriculture are related to:

- Machinery such as tractors, trucks and harvesters, and cutting and piercing tools;
- Hazardous chemicals: pesticides, fertilizers, antibiotics and other veterinarian products;
- Toxic or allergenic agents: plants, flowers, dusts, animal wastes, gloves (chrome), oils;
- Carcinogenic substances or agents: certain pesticides such as arsenicals and phenoxy-acetic herbicides, UV radiations, parasitic diseases;
- Transmissible animal diseases: brucellosis, bovine tuberculosis, hydatid disease, tularemia, rabies, Lyme disease, tinea, listerioses;
- Other infectious and parasitic diseases: leishmaniasis, bilharziasis, facioliasis, malaria, tetanus, mycosis;
- Confined spaces such as silos, pits, cellars and tanks;
- Noise and vibration;
- Ergonomic hazards: use of inadequate equipment and tools, unnatural body position or prolonged status postures, carrying of heavy loads, repetitive work, excessive long hours;
- Extreme temperatures due to weather conditions.
Major hazards can be divided as:

i) Physical hazards
   - heat and humidity
   - cold
   - solar rays
   - noise
   - vibration (segmental or whole body).

ii) Chemical hazards
    - pesticides
    - Occupational health in special areas
    - fertilizers
    - animal feed additives.

iii) Biological hazards
     - zoonoses
     - snakebites and insect and scorpion stings
     - major communicable occupational diseases.

iv) Dust hazards
    - from soil, plants or animals
    - may contain silica, fungal matter, animal matter, including insects and excreta,
    - storage mites, grain dust and flour dust
    - also may contain agricultural chemicals such as fertilizers and pesticides.

v) Ergonomic hazards
   - heavy work
   - repetitive tasks
   - poor ergonomic design of tools and equipment
   - incorrect working habits.

Hazardous Substances

Hazardous substances come in many forms in agriculture and forestry operations; they can be pesticides, fuels, chemicals or paints, manure or medicines, animal fluids or even construction materials. They are important to your operation; however, while using them, you may inadvertently be, inhaling, contacting or ingesting them.
Hazardous substances can be:

- Pesticides and fumigants
- Paints/timber preservatives
- Solvents
- Cleaning agents/disinfectants
- Veterinary medicines
- Fertilisers
- Manure/slurry, mould
- Fuels and oils
- Asbestos
- Wood dust
- Grain in large quantities.

2.4.1 Agrochemicals

The public health effects of pesticides have long been known and the undesired effects of chemical pesticides have been recognized as a serious public health concern during the past decades. In appropriate use, handling and disposal of agrochemicals could have adverse health and environmental impact.

People can be exposed to pesticides in three ways:

- Breathing (inhalation exposure).
- Getting it into the mouth or digestive tract (oral exposure).
- Contact with the skin or eyes (dermal exposure).

Pesticides can enter the body by any one or all three of these routes. Inhalation exposure can happen if you breathe air containing pesticide as a vapor, as an aerosol, or on small particles like dust. Oral exposure happens when you eat food or drink water containing pesticides. Dermal exposure happens when your skin is exposed to pesticides. This can cause irritation or burns. In more serious cases, your skin can absorb the pesticide into the body, causing other health effects. Many of the chemical pesticides can have harmful effects on human beings either as acute or chronic toxicity. Acute exposure to pesticides can lead to death or serious illnesses. About 355,000 people die globally each year due to unintentional acute poisonings. Two thirds of these deaths occur in developing countries where such poisonings are associated with excessive exposure and or inappropriate use of toxic chemicals and pesticides present in occupational and domestic environments. The cumulative health impacts of human exposures to various agrochemicals can be a factor in a range of chronic health conditions and diseases like cancer, reproductive, endocrine, immunological, congenital and developmental disorder.

Few of the effects of harmful agrochemicals are described below:

- Residues of pesticides and herbicides affect the central nervous system, respiratory and gastro intestinal system of human beings. Some pesticides
can also cause wheezing and nausea by irritating the lungs if large amounts are inhaled.

- Chemical residues also cause depression, insomnia, oral acetomatism, myoclonus and hyper reflexia of man.
- Accumulation of excess nitrogen in plants causes an infant disease, methaemoglobinemia
- Amines produced from the nitrogenous fertilizer cause cancer in human beings
- Aluminum at high levels leads to birth defects, asthma, alzheimers and bone diseases.
- Calcium toxicity results in developmental and neurological toxicity, growth retardation, cognitive delay, kidney, nervous and immune system damage.
- Cobalt only at high levels leads to lung damage.
- Boron causes low sperm count, nose, throat and eye irritation.
- Manganese is suspected to damage the respiratory reproductive and gastrointestinal systems.
- Lindane can cause breast cancer and acts as nerve poison. It also affects the reproductive system and is known as carcinogen.
- Chloropyripos can cause fetal malnutrition, pneumonia, muscle paralysis and even death to respiratory failure.
- Malathion can damage nervous system, if it enters the body.
- DDT (Dichloro diphenyl trichloro ethane) a common insecticide, affects the nervous system and could act as a carcinogen. Women diagnosed with breast cancer were six to nine times more likely to have the pesticides DDT or hexachlorobenzene in their blood streams compared to women who did not have breast cancer.
- There is a strong association between breast cancer and exposure to chemical pesticides.
- The excessive application of potassium fertilizers decreased vitamin c and carotene content in vegetables an excessive application of nitrogenous fertilizers increased the incidence of pests and diseases in crop plants.60 percent of all herbicides (weed killers), 90 percent of all fungicides (mold killers) and 30 percent of all insecticides (insect killers) are potentially cancer causing.

Workers who mix, load or apply pesticides (known as pesticide handlers) can be exposed to toxic pesticides due to spills and splashes, defective, missing or inadequate protective equipment, direct spray, or drift. Workers who perform hand labor tasks in areas that have been treated with pesticides face exposure from direct spray, drift or contact with pesticide residues on the crop or soil. Workers may be exposed to pesticides in a variety of ways

1. working in a field where pesticides have recently been applied;
2. breathing in pesticide “drift” from adjoining or nearby fields;
3. working in a pesticide-treated field without appropriate PPE;
4. eating with pesticide-contaminated hands;
5. eating contaminated fruits and vegetables;
6. eating in a pesticide-contaminated field.
7. Workers may also be exposed to pesticides if they drink from, wash their hands, or bathe in irrigation canals or holding ponds, where pesticides can accumulate.

Check Your Progress 1

Note:  

a) Write your answer in about 50 words.
b) Check your progress with possible answers given at the end of the unit.

1) Describe various activities performed in agriculture and allied sectors?
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2) List down the effect of various agrochemicals to us?
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2.4.2 Agriculture Respiratory Hazards

Agriculture is a very diverse industry that includes multiple occupational and environmental exposures and widely varying work practices. There are specific respiratory hazards associated with the various commodities and associated work practices. Agriculture is considered one of the most hazardous occupations. Organic dusts and toxic gases constitute some of the most common and potentially disabling occupational and environmental hazards. The changing patterns of agriculture have paradoxically contributed to both improved working conditions and increased exposure to respiratory hazards. Animal confinement operations with increasing animal density, particularly swine confinement, have contributed significantly to increased intensity and duration of exposure to indoor air toxins. Ongoing research has implicated bacterial endotoxins, fungal spores, and the inherent toxicity of grain dusts as causes of upper and lower airway inflammation and as immunologic agents in both grain and animal production. Animal confinement gases, particularly ammonia and hydrogen sulfide, have been implicated as additional sources of respiratory irritants. It has become evident that a significant percentage of agricultural workers have clinical symptoms associated with long-term exposure to organic dusts and animal confinement gases. Respiratory diseases and syndromes, including hypersensitivity pneumonitis, organic dust toxic syndrome, chronic bronchitis, mucous membrane inflammation syndrome, and asthma like syndrome, result from ongoing acute and chronic exposures.
Respiratory hazards are often associated with crop and livestock production. Farm structures like the silo, grain bins, manure storage facilities and livestock confinement barns are environments possessing the greatest respiratory hazards. Farmer’s Lung Disease and Organic Dust Toxicity Syndrome have been found particularly among dairy and swine workers. Much agriculture health related hazards are difficult to identify because of the delayed appearance of symptoms or ill-effects, confounding exposure variables, and unhealthy life-styles or behavior patterns. Suffocation in agricultural occupations usually are associated with solid flowing materials such as grain, or in confined spaces that may lack oxygen such as silos, tanks, and refrigeration units.

Drowning on farms can occur in many settings, including farm ponds, manure pits or lagoons, field ditches, livestock watering tanks, and plastic buckets. Agricultural poisoning are most often caused from the ingestion or absorption of chemicals used in the production of crops or livestock. Poisoning also occurs from the inhalation of mold spores, dusts, and gases during the planting, harvesting and storage of food and fiber. Many farm homes are older structures that may have confounding lead exposure problems. Currently there are no reporting requirements for doctors or hospitals to report agricultural related poisonings or diseases (such as farmers lung) that result from an agricultural poisoning exposure.

Table 2.2 Agricultural respiratory hazards and diseases

<table>
<thead>
<tr>
<th>Categories</th>
<th>Sources</th>
<th>Environments</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic dusts</td>
<td>Grain, hay, endotoxin, silage, cotton, animal, feed, animal byproducts, cotton</td>
<td>Animal confinement operations, barns, silos, harvesting and processing, microorganisms operations</td>
<td>Asthma, asthma like syndrome, chronic bronchitis, hypersensitivity pneumonitis, (Farmer’s Lung)</td>
</tr>
<tr>
<td>Silicates</td>
<td>Harvesting/tilling, Pulmonary</td>
<td></td>
<td>Fibrosis, chronic bronchitis</td>
</tr>
<tr>
<td>Gases</td>
<td>Ammonia, hydrogen, sulfide, nitrous oxides, methane, CO</td>
<td>Animal confinement facilities, silos, fertilizers</td>
<td>Asthma like syndrome, silo filler’s disease, pulmonary edema, tracheobronchitis,</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Paraquat, organophosphates, fumigants,</td>
<td>Applicators, field workers</td>
<td>Pulmonary fibrosis, pulmonary edema, bronchospasm</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>Anhydrous ammonia</td>
<td>Application in fields</td>
<td>Mucous membrane irritation</td>
</tr>
<tr>
<td>Disinfectants</td>
<td>Chlorine, quarternary compounds</td>
<td>Dairy barns, hog confinement</td>
<td>Respiratory irritant, broncho Spasm</td>
</tr>
<tr>
<td>Solvents</td>
<td>Diesel fuel solutions</td>
<td>Pesticide Storage containers</td>
<td>Mucous membrane irritation</td>
</tr>
<tr>
<td>Welding fumes</td>
<td>Nitrous oxides, ozone, metal</td>
<td>Welding operations</td>
<td>Bronchitis, metals fume fever, emphysema</td>
</tr>
<tr>
<td>Zoonotic infections</td>
<td>Microorganisms, Animal husbandry</td>
<td>Veterinary services, veterinary services</td>
<td>Anthrax.</td>
</tr>
</tbody>
</table>

2.4.3 Musculoskeletal Disorders in Agricultural Industry

Farm machinery is a leading source of fatalities and injuries in agriculture. Farmers and farm workers are exposed to several environmental and occupational hazards. Farm accidents have been attributed to a number of factors. Fatigue, haste, and stress can cause farmers to undertake activities that they know are unsafe. The speed and sophistication of farm machinery means that the slightest error by the operator can cause serious accidents. Animal related accidents are another main source of fatalities and injuries in agriculture. Specific sources of injuries on high priority in the agricultural sub-sector include:

- Motorized vehicles and heavy machinery, including all-terrain vehicles (ATVs), utility task vehicles (UTVs), and industrial vehicles
- Livestock
- Falls associated with working surfaces and work at heights
- Grain bins and augers
- Workplace violence, including human trafficking, bullying and sexual harassment (male and female)

Musculoskeletal disorder in agriculture includes illnesses of the back and neck, epicondylitis, nerve entrapment syndromes, peritendinitis, tendinitis, tenosynovitis, and non-specific muscle and forearm tenderness. However, the majority of musculoskeletal problems from the farmers and farm workers is non specific and lacks a well defined clinical diagnosis. The occurrence of specific disorders and syndromes are not accurately known because many of these conditions are difficult to classify from epidemiologic studies.

Stretching while fruit-picking, bending for planting, weeding and picking from low-rise plants, lifting and carrying heavy weights, handling machinery, driving long distances, various tasks that involve pulling and pushing these tasks almost always cause the farmer or farm worker to suffer from various musculoskeletal disorders including lower back pain, strains and sprains within the spine, legs, hands, shoulders and neck. Tobacco harvesters, for example, develop wrist problems due to the continuous wrist movement when collecting tobacco leaves by hand as do dairy farmers from the amount of wristwork even involved in mechanised milking. Exposure to weather extremes while in the field may lead to hypothermia, frostbite, sunstroke, heatstroke, dehydration and skin cancer.

Livestock farming makes a major contribution to the food industry as well as being a main source of income for many families world over. Many zoonotic diseases such as anthrax, tinea capitis etc. are associated with skin contamination. Improvements in husbandry practices, efficient ventilation, frequent vaccinations of animals, quarantining sick animals and good personal hygiene may reduce the risk of contamination. Tending to a sick animal presents the risk of contracting rabies and tularemia. Animals are also associated with numerous allergies, symptoms of which are usually hives, swelling, nasal discharge, itching and asthma. Working with animals can also expose you to the risk of contracting a pandemic virus such as psittacosis, swine flu, avian flu, etc. Exposure to animal urine may transmit cryptosporidiosis.
A farmer’s work often involves carrying excessive loads, long hours of standing, reaching, bending and others tenuous postures, all of which can lead to joint, back and hip pain and injuries. In dairy farming, manual milking is considered the single most hazardous activity to the musculoskeletal system, because the farmer may need to bend and stoop four to six times per cow. Even mechanized milking poses significant musculoskeletal risks and parlour design is critical. These repetitive actions may lead to arthritis. Modern well-developed milking parlours relieve this problem as they allow the simultaneous milking of several cows; the worker or farmer stands at a lower level than the animals and does not need to bend. The milk is piped into a mass storage container so the worker does not need to carry buckets manually. Other work activities in agriculture requiring bending and twisting actions pose similar risks to workers. Catching poultry for transportation can lead to musculoskeletal disorders as the worker needs to repeatedly reach out and grasp struggling birds.

2.4.4 Zoonotic Diseases

The livestock revolution in developing countries has been associated with the growth of unprecedented concentrations of animals in the urban areas of developing countries, with major implications for human and animal health. Farming methods have changed dramatically in recent decades. Production has become increasingly industrialized, with larger numbers of animals stocked at higher densities, coupled with breeding and feeding strategies aimed at maximizing production. These changes have a huge impact on the welfare of farmed animals we rear for food and can increase the risks to people and animals from some zoonotic diseases.

Where people are in contact with animals, there is always the risk of contracting a zoonotic disease. Not all animal diseases are transmittable to humans but many of them are. Zoonotic diseases, or zoonoses, are diseases that can be transmitted from vertebrate animals to humans. Zoonoses are caused by bacteria, protozoa, fungi, viruses, parasites or prions, which are often, part of an animal’s natural flora (i.e., microorganisms that live in and on the animal) but are able to cause disease in humans. Infections can result from direct contact with animals or their products such as manure or placenta. Direct transmission can also occur through consumption of animal products (e.g., raw meat, raw milk, etc.) or through an animal bite. Humans can also become indirectly infected by contact with contaminated soil, food, or water. Farmers, ranchers, veterinarians, slaughterhouse workers, and other agricultural workers have a higher risk of contracting zoonoses because of their close contact with animals.

Zoonotic diseases of significance in developing countries fall into three categories

- based on the form of transmission:
  - foodborne (cysticercosis, brucellosis, tuberculosis),
  - infectious (avian influenza, tuberculosis),
  - vector-borne (rabies or trypanosomosis).

An agricultural worker’s risk of acquiring a zoonotic, arboviral or other animal-borne infection varies with the type of work tasks he or she performs, the kind(s) of animal(s) to which he or she has exposure and the geographic location of the worksite.
Zoonotic diseases include: Anthrax, Bovine Tuberculosis, Brucellosis, Cryptosporidiosis, Giardiasis, Hantavirus diseases, Leptospirosis, Ovine Chlamydiosis, Psittacosis and Rabies. Outbreaks of avian flu (normally produces a mild disease in aquatic birds), Q fever (a disease common in cattle, sheep and goats), and certain strains of methicillin-resistant Staphylococcus aureus (MRSA). Arboviruses are infectious agents that are transmitted to humans by arthropods, such as ticks and mosquitos. The recent Zika and West Nile Virus outbreaks are examples of arbovirus outbreaks.

2.4.5 Allergies And Skin Diseases

Allergies to insect stings and reptile bites can cause anything from mild swelling to anaphylactic shock and death. Skin infections are very common in farming and forestry. Continuous contact with biological agents, the earth, flora, pesticides and fertilisers, debris, animals, manure and timber can result in infections, swelling, scars and the development of fungi. Many zoonotic diseases such as anthrax, tinea capitis are associated with skin contamination.

2.5 FORESTRY

Forestry continues to be one of the most hazardous industrial sectors in most countries. Around the world, there are often discouraging trends of rising accident rates and a high incidence of occupational diseases and of early retirement among forestry workers. Logging workers had the highest fatal work injury rate. In mechanized logging, the highest accident rate results from equipment maintenance and repairs and manual logging of remote areas. Falls can occur when body parts are pinned between logs or equipment whereas struck by injuries can occur from falling trees branches, rolling logs, or kickback from power saws.

The occupational health and safety issues often associated with forestry activities primarily include:

- Physical hazards (Climate, Motor manual work, Noise, Vibration)
- Chemical hazards
- Biological hazards
- Machine safety.

Injuries can result from:

- Physical hazards: noise, uneven ground, forest debris, obstructions, and extreme weather
- Motorized vehicles and heavy machinery, including ATVs, loading and transporting hazards
- Tools used for cutting and moving trees, felling, etc.
- Other safety hazards such as fire hazards and electric power lines.

Numerous health complaints by forestry and logging workers have resulted from work-related exposures to known ergonomic hazards, including machines with significant ergonomic deficiencies. Mental health, fatigue, stress, bullying/power imbalances, and substance abuse among foresters and loggers have been
Occupational Hazards recognized in the forestry industry as worker safety and health issues that should be addressed. The forest sector has range of chemical hazards, including the potential for exposure to fumes associated with chainsaw use and to pesticides, and biological hazards such as the potential for allergic reactions to plants, pollen and insect bites.

Forest Fires

Forest fires are a common emergency situation encountered in forestry. More than 90% of forest fires are caused by human factors. Smoking, fuel leaks, vehicles, hand tools and forest camps are the usual causes. Forest fires are extremely dangerous due to the abundance of flammable material, sudden wind changes, inaccessible terrain. Fires are unpredictable: they move uphill, spread quickly and follow wind direction. Forest fires often result in serious injuries or fatalities and extensive damage to forestry. Fires cause burns, asphyxia, respiratory problems and eye irritation. If the fire is detected early, it is easier and safer to extinguish. Hazards associated with firefighting include excessive heat radiation and poor visibility due to smoke and dust. It may be difficult to get supplies to the firefighters and remove injured people.

2.6 FISHING

Commercial fishing continues to be one of the most dangerous industries. Farmhands and other workers and aquafarms are susceptible to many physical hazards in the course of their work as noise, injuries, sting from fish spines, cuts, sprain, fracture and snake bites. Biological hazards included parasitic infestation (weeds in ponds nematodes and cestodes) and pathogenic infections (fungal, Vibrio in intensively manured ponds).

The majority of the deaths occurred after a vessel disaster (defined as a sinking, capsizing, or other event in which the crew was forced to abandon ship) or a fall overboard. The body of evidence regarding fatal work-related injuries has become well-developed over the past two decades. The hazards such as: skiff-related fatalities, icing, capsizing, flooding, fire and explosions are also very frequent. Besides ergonomic hazards, fishing workers are also exposed to environmental, biological hazards, such as extreme weather conditions, ultraviolet exposure, zoonotic and vector-borne diseases, and allergens. Mental health, stress, and substance abuse may be common among workers in the commercial fishing subsector.

The main causes of death were drowning, hypothermia and injuries from impact or contact with the vessel or machinery. Potting was the most dangerous work activity accounting for just over a third of the fatalities. Some of the main contributing factors to these fatalities were:

- fatigue;
- modification of the vessel and related stability issues;
- overloading of the vessel affecting stability;
- slips;
- unsafe systems of work; and
- weather and environmental conditions.
2.7 GREENHOUSE HAZARD

Greenhouse structures include glasshouses or plastic-covered structures. Greenhouses may pose various hazards, depending on their construction materials:

a. suffocation due to collapse of plastic cover;
b. injury (cuts and lacerations) due to glass breakage;
c. contact with corroded/rusty metal parts;
d. spread of fire due to flammable materials.

Workers are exposed to an ‘enclosed’ space situation where environmental factors such as temperature, humidity, air quality and quantity, dust concentration may influence your ability to work safely and effectively. A combination of high temperature and humidity can create extremely uncomfortable working environments which may lead to heatstroke, respiratory problems, fatigue and loss of consciousness. Such working conditions together with the use of pesticides and fertilisers can increase both the likelihood and severity of harm. Make a careful selection of pesticides and use appropriate personal protective equipment (mouth, nose, eyes protection) and wear suitable clothing. In greenhouses, environmental conditions are controlled mechanically using artificial heat sources, fans and ventilation systems, shading and cooling mechanisms, humidification and climate-control equipment. While the use of these systems decreases our exposure to environmental hazards, it may expose to electrical and mechanical hazards, noise and biological hazards (Legionella bacteria).

Check Your Progress 2

Note:  
   a) Write your answer in about 50 words.
   b) Check your progress with possible answers given at the end of the unit.

1. Discuss various respiratory disorders caused by various agricultural activities.

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2. What are Zoonotic diseases?

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2.8 LET US SUM UP

Agriculture is the cornerstone of Indian economy and also for any developing country dependent on primary sector. Like other secondary and tertiary sectors, agriculture and allied sectors too has its own occupational hazards. We have
Occupational Hazards

studied in this unit various occupational hazards associated with agriculture and allied sectors. This can be summarised in the following points:

- Occupational hazards pertaining to agriculture and allied sectors.
- Hazards associated with irrational use of agrochemicals.
- Respiratory hazards, musculoskeletal disorders in agricultural industry and zoonotic diseases.

2.9 KEY WORDS

Hazard : Anything that might cause harm to a person.
Hazardous substance : Products that can harm a person’s health causing illness, injury or disease. E.g.: Pesticides
Pesticides : Pesticides are diverse group of chemicals used to contain or manage the pests in the specific crops and specific situations.

2.10 REFERENCES AND SUGGESTED FURTHER READING


2.11 ANSWERS TO CHECK YOUR PROGRESS

Answers to Check Your Progress 1

1. Your answer should include the following points:

Agricultural workforce is involved in diverse activities like crop cultivation, animal husbandry, harvesting, processing and storage of agricultural products.

2. Your answer should include the following points:

- Residues of pesticides and herbicides affect the central nervous system, respiratory and gastro intestinal system of human beings.
- Chemical residues also cause depression, insomnia, oral acetomatism, myoclonus and hyper reflexia of man.
- Accumulation of excess nitrogen in plants causes an infant disease, methaemoglobinemia
- Amines produced from the nitrogenous fertilizer cause cancer in human beings
- Aluminum at high levels leads to birth defects, asthma, alzheimers and bone diseases.
Calcium toxicity results in developmental and neurological toxicity, growth retardation, cognitive delay, kidney, nervous and immune system damage.

Answers to Check Your Progress 2

1. Your answer should include the following points:

   Respiratory disorders caused by various agricultural activities are asthma, chronic bronchitis, hypersensitivity pneumonitis, fibrosis, chronic- bronchitis, Pulmonary fibrosis, pulmonary edema, bronchospasm, etc.

2. Your answer should include the following points:

   Zoonotic diseases, or zoonoses, are diseases that can be transmitted from vertebrate animals to humans. Zoonoses are caused by bacteria, protozoa, fungi, viruses, parasites or prions, which are often, part of an animal’s natural flora (i.e., microorganisms that live in and on the animal) but are able to cause disease in humans.